RESEARCH HIGHLIGHT
Basic Energy Sciences Program
Geosciences Subprogram

Project: Organic Anion - Mineral Surfaces

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Objective: The general focus of this project is mineral surface geochemistry. The specific focus is organic acid interactions with mineral surfaces.

Results: Petrologic analyses, thermodynamic calculations and experimental weathering results point to extensive Ca leaching, and consumption of marine CO_2 during alteration of seafloor basalts. Basalt weathering in seawater-like solutions is measured to be sensitive to temperature. The activation energy for initial basalt weathering in seawater is measured to be 41-65 kJ mol^{-1}. Seafloor weathering temperatures are set by deep ocean fluids under high fluid to rock ratios and there appears to be a sizeable feedback between weathering and atmospheric CO_2.

Significance: The results, soon to be published in Geochimica et Cosmochimica Acta, show that weathering of the seafloor by deep ocean waters is a major sink for atmospheric CO_2. The coupling between the latter, high latitude air temperatures, and carbon dioxide consumption by weathering of abyssal basalts constitutes a previously unknown mechanism by which global climate is moderated over geologic time. This feedback loop between atmospheric CO_2 and carbon dioxide-consuming seafloor weathering reactions appears to be comparable but somewhat weaker than the analogous loop between continental weathering and climate (see figure 1).

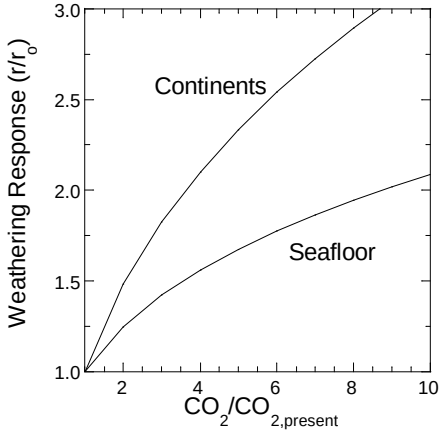

Figure 1. Response of continental and seafloor weathering to changes in atmospheric CO_2 levels.

Publication: A journal article entitled "Seafloor weathering controls on atmospheric CO_2 and global climate" has been written by P. V. Brady and S. R. Gislason (Geochim. Cosmochim. Acta, in press).